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ABSTRACT

Occupational adaptability is an important consideration in the development of programs related to occupational exploration, career development, and vocational education. Intended to be an authoritative analysis of the literature in the field, this state-of-the-art paper should assist in identifying substantive problems and methodological approaches for researchers and curriculum development specialists as well as providing practitioners with a summary of research findings that have application to educational programs. Research is categorized by: (1) Occupational Adaptability Studies, (2) Job Analysis, (3) Curriculum-Oriented Work, (4) Work Adjustment, and (5) Critique. An extensive bibliography is appended. (GB)

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REVIEW AND SYNTHESIS OF RESEARCH ON OCCUPATIONAL ADAPTABILITY

Douglas Sjogren
Professor of Education
Colorado State University

ERIC Clearinghouse on Vocational and Technical Education
The Center for Vocational and Technical Education
The Ohio State University
1900 Kenny Road Columbus, Ohio 43210

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PREFACE

This *Review and Synthesis of Research on Occupational Adaptability* is one of a series of "state of the art" papers in vocational and technical education and related fields. Occupational adaptability is an important consideration in the development of programs related to occupational exploration, career development, and vocational education. This publication should assist in identifying substantive problems and methodological approaches for researchers and curriculum development specialists as well as providing practitioners with a summary of research findings that have application to educational programs.

This review is intended to be an authoritative analysis of the literature in the field. Those who wish to examine the primary sources of information should utilize the bibliography. Where ERIC document numbers and ERIC Document Reproduction Service (EDRS) prices are cited the documents are available in microfiche and hard copy form.

The profession is indebted to Douglas Sjogren for his scholarship in the preparation of this report. Recognition is also due Jerome Moss, University of Minnesota, and James Altman, Synectics Corporation, Allison Park, Pennsylvania for their critical review of the manuscript prior to its final revision and publication. J. David McCracken, information specialist at The Center, coordinated the publication's development.

Members of the profession are invited to suggest specific topics or problems for future reviews.

Robert E. Taylor
Director
The Center for Vocational
and Technical Education
ERIC Clearinghouse on
Vocational and Technical
Education

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REVIEW AND SYNTHESIS OF RESEARCH ON OCCUPATIONAL ADAPTABILITY

PROBLEM STATEMENT

Vocational education is at a crisis. Kraft (1970) identified the focal point of the crisis when he wrote:

> For many years educators have ignored technological changes in higher technical education and vocationally oriented training; they have persisted in preparing students for a world viewed from an inherited, often locally oriented outlook. Only recently have educators recognized the need for a positive attitude toward space age technology; thus, constructive ideas have been developed regarding the adjustment of vocational and technical curricula in order to prepare students for their future roles . . . The system of vocational training and higher technical education must be endowed with a capacity for change and innovation so it can adequately respond to the legitimate pressures and demands of modern society.

We are at a turning point in vocational education—turning from a system that was oriented to a stable society with stable work-roles to a system oriented to a dynamic society in which rapid and profound changes are occurring. What are the changes that are occurring and what are their implications?

Foremost are the technological changes that effect obsolescence of jobs and stimulate new jobs (See Tavis and Gerber, 1969). Ganon, *et al.* (1967) indicated that in the long run this is not a problem if adjustments can be made for retraining and transfer. It is the proviso that is important to the vocational educator. How can vocational education facilitate this retraining and transfer to minimize the negative impact of technological change for the individual and society?

The civil rights revolution is another societal change that has implications for vocational education. For years members of minority groups in our society have been underemployed in dead-end jobs. They will no longer accept a subservient role and are demanding opportunity to advance. Fine (1967) has pointed out how this requires the creation of new career lines and how important it is to identify career lines from any job. The emergence and the creation of new careers is not, however, merely a means to placate minority groups. Their legitimate concerns have only demonstrated that any worker should have opportunity to advance. New careers are emerging in many areas. Can vocational education adapt readily to these new careers and contribute to the identification of additional career lines?

A third force in our society with implications for vocational education is the attitude that educational programs should demonstrate both effectiveness and efficiency. The popular term now is accountability. This term, however, when translated into practice, means that educational programs should do what is intended at the least cost. Vocational education is not only at a crisis, it is also in a crunch. The demands on vocational

education are increasing at a more rapid rate than its support. How can vocational education adequately respond to these two forces?

Vocational educators have recognized the dilemma they are in and are attempting to resolve it. Bushnell (1969) pointed this out when he wrote, "Opening up career options and preparing students for their larger role responsibilities became one of the concerns of curriculum researchers who rallied to the cause of reform following the passage of the Vocational Education Act of 1963." Especially since 1963, vocational educators have been studying and experimenting to develop programs that can satisfy the criteria of being efficient for the individual and society and also effective in preparing the individual to adapt in the dynamic world of work. Many of these efforts have produced results that are important for the vocational educator. This paper is an attempt to review and synthesize these studies and some related studies to determine the implications they might have for program planning and to identify the questions that are still unresolved.

The common thread through all of the studies reviewed is that they all have some bearing on the concept of occupational adaptability. Consequently, this term, which is used in the title, is the theme of the review.

SOME BASIC CONCEPTS

The idea of occupational adaptability connotes terms like generalizability, transfer, association, etc. An individual who is adaptable is one who can generalize, transfer, or form associations so that the skills, attitudes, and understandings that have been learned or developed in one context can be readily used in a different context. Thus, the problem of occupational adaptability is an aspect of the general problems of transfer and generalizability that have been studied by psychologists and educators for some time. (A good discussion of this point is in Altman, 1966b.)

It is not our intent to review the vast number of studies that have been done on transfer of training. It is important, however, to realize that there is a strong theoretical base that is relevant to the problem of occupational adaptability. Some of the work that is especially relevant is reviewed briefly in the following paragraphs.

Gagne (1965) has demonstrated a hierarchical nature to learning in some situations. Many cognitive skills can be analyzed and the prerequisite behavior for learning the skill can be identified. The hierarchical model that Gagne offers seems to be one that can be applied to occupational adaptability especially in the career line situation. His work is quite representative of the thinking of the behaviorists on transfer and generalizability. A useful summary of the behaviorist position as it applies to curriculum development has been made by Altman (1967) and Altman (1970).

Thorndike (1931) has long been credited with first demonstrating the relationship between transfer and similarity of content. This finding has been examined in many situations over the last several years. Much

of the work has been in the area of studying the formation of verbal associations. A vast literature has developed in this area, and a good introduction to it is in Cofer and Musgrave (1963).

Ausubel and others have performed a series of experiments that are quite important in clarifying the relationship identified by Thorndike. (Rather than cite all of the Ausubel references, the reader is directed to Ausubel, Stager, and Gaite (1969), the reference list of which contains references to other work.) The experiments have demonstrated that learning and retention of new material is facilitated if the learner has a stable and clear knowledge of a clear set of anchoring ideas. For example, persons with a good knowledge of Christianity learn about Buddhism more readily than those with less knowledge of Christianity. The knowledge of concepts of Christianity provides the set of anchoring ideas for learning the concepts of Buddhism. This series of experiments is quite important for the curriculum developer who is interested in facilitating general learning. Certainly the adaptability of an individual to different situations would be facilitated as he has available a repertoire of anchoring ideas for adapting to the new situation.

In terms of the transfer question as it relates to occupational adaptability, the works of Gagne, Ausubel, and many associationists seem to be most relevant as a theoretical base. Many of the job-clustering studies reviewed later in this paper have in fact used one or more of these as their theoretical base.

Another aspect of studying occupational adaptability is the need to identify and classify behaviors at a more abstract level than the behavior specific to a single job. For example, in examining common mathematical behaviors across occupations it is necessary to consider general mathematical skills rather than those skills specific to one occupation. Guilford (1967) has developed a model of the human intellect that provides a means for identifying and classifying cognitive behaviors. In the psychomotor realm, Fleishman has identified a number of psychomotor factors that could be readily used for classifying such behavior. (Fleishman and his associates have reported a number of relevant studies. We cite just one here and the reader can go to that study to identify other references; Fleishman and Ellison, 1962). Cratty (1967) is another excellent source to use in work on classifying motor behaviors.

The classification of affective behaviors has not received as much attention as the cognitive and psychomotor behaviors from the learning point of view. Krathwohl, Bloom, and Masia (1964) have made an effort in this regard that is helpful. Theoretical developments in the area of occupational choice and interest are of particular relevance to occupational adaptability, especially in the affective area. Many of the theories emphasize affective behaviors such as interests, attitudes, and values in identifying those occupations for which a person might be suited. Three excellent sources for identifying the theoretical work in this area are Borow (1964), Tennyson (1968), and Osipow (1968).

The purpose of this brief overview of related theory was to emphasize that there is a rather extensive rationale for empirical studies and program development in occupational adaptability. The theories are not complete, but they do provide a starting point for considering methodology, procedure, and content of studies and programs. Several of the studies reviewed in the remainder of the paper have derived from and have contributed to the theories.

EMPIRICAL STUDIES

The studies in this section of the paper are reviewed under five broad headings: occupational adaptability, job analysis, curriculum-oriented work, work adjustment, and critique.

Occupational Adaptability Studies

There have been surprisingly few studies on the adaptability of workers from one job to another. Weinstein (1969) studied the spillover effects of military training and service to civilian occupations using a large sample of army and navy veterans. He found that only 16 percent of the army veterans and 28 percent of the navy veterans used their skills learned in the military in their civilian work. Generally, the post-service employment was more related to preservice employment than to the military specialty. He also found that there was no effective mechanism to aid veterans to capitalize on their service experience.

The transferability of defense engineers to commercial work was studied by Rittenhouse (1967). He studied a large number of engineers and managers who had made such a transfer and found no important job-related barriers. Any training requirements seemed to be provided for with on-the-job and other in-house programs. Defense engineers appeared to be best suited for work in research and development, new design, advanced engineering, and analytical areas in the commercial establishments.

The California State Department of Employment (1968) has conducted an extensive study of the transfer of industrial skills from defense to nondefense industries. A high degree of skill transferability was found, and the problems of transfer were due to limited manpower needs, wage differentials, hiring practices, union regulations, and license requirements.

The writer feels that there must be more studies of persons who have changed jobs with the purpose of identifying factors related to success in the change, but few were found. There are many studies of mobility and some of these are reviewed later in this paper. It does seem that some case studies and normative studies of job changers would be useful. Furthermore, such studies could be designed to test hypotheses generated from occupational choice or transfer theories and thus serve to broaden our theoretical base.

Job Analysis

The literature on job analysis is quite extensive. Marsh (1962) published a *Job Analysis Bibliography* with 1,511 references. In this section, however, only two research programs will be reviewed. These studies have not been concerned with training, but only with studying and classifying jobs. The studies do have relevance for planning for occupational adaptability, however, in that they show results that have relevance in terms of behaviors that are generalizable across jobs.

The 1965 edition of the Dictionary of Occupational Titles (DOT) (Department of Labor, 1965A, 1965B) was the culmination of an extensive research program. The research is reported in a number of studies by Studdiford (1951, 1953); Fine (1955A, 1955B, 1957A); Fine and Heinz (1957, 1958); Newman and Fine (1957); and Trattner, Fine, and Kubis (1955). The result was an occupational classification system with 603 occupational groupings based on nine occupational categories and 84 occupational divisions in terms of subject matter, activity, products, services, or areas of work. Also, there is a classification of the jobs in terms of the level at which the worker must function with respect to each of the general headings of Data, People, and Things. Finally, 114 worker trait groups were defined in terms of the common traits and abilities required of the workers.

The work on the 1965 DOT and the publication are important advances in resolving the problem of occupational adaptability. The research base of the DOT and the classifications developed are useful for other researchers working in this area. Furthermore, the publication is an important tool for counselors and for developers of occupational programs who are striving to effect adaptability. An interest survey based on the DOT has been developed by D'Costa (1968). The scale has demonstrated high reliability, and it should be a valuable counseling tool, especially if used with the DOT.

Another extensive program of research on job characteristics has been conducted by McCormick and several associates at Purdue University. The following references provide a good summary of the development of their research program: McCormick, Finn, and Schieps, 1957; Palmer and McCormick, 1961; Gordon and McCormick, 1963; Cunningham and McCormick, 1964; and McCormick, 1964. This research program has evolved from an original emphasis on the job to an emphasis on identifying and classifying the behaviors of workers (McCormick, Jeanneret, and Mecham, 1969). McCormick has developed an instrument for the analysis of jobs called the Position Analysis Questionnaire (PAQ). The PAQ contains 189 items grouped into six general areas: information input, mediation processes, work output, interpersonal activities, work situation and job context, and miscellaneous. Each of the items is a possible element of a job and the relevance of the element to the job is rated on an appropriate scale. The PAQ has demonstrated high reliability. A factor analysis of data obtained from an administration of the PAQ revealed five dimensions that were named as follows: Decision, Communication, and

Social Responsibilities; Skilled Activities; Physical Activities and Related Environmental Conditions; Equipment and Vehicle Operation; and Information Processing Activities.

A next step in the research was to obtain ratings of the extent to which some 68 human attributes were necessary to satisfactory performance on each job element. The ratings yielded attribute "profiles" of job elements. The validity of the ratings was established by relating the attribute profiles to the aptitude test scores of people on jobs. The results were encouraging. The methodology and the instruments developed in the program of study were judged to offer "promise of serving certain practical purposes such as job evaluation and the establishment of synthetically-derived attribute requirements of individual jobs" (McCormick, *et al.*, 1969).

Curriculum-Oriented Work

The DOT and the McCormick research programs were oriented toward describing jobs and workers without specific regard for implications in terms of training the worker for the job. In the last decade especially, many studies have been conducted that have attempted to identify clusters of occupations. The identified clusters were expected to enable the program developer to design programs that would be both efficient and effective in preparing workers who would be occupationally adaptable. Whether these purposes have been met is still a moot question, but the studies have made a contribution to our understanding of the world of work. The studies reviewed in this section have as their common theme the identification of job or behavior clusters for program planning purposes.

The most common method employed is to conduct a job analysis and then form clusters on the basis of an arbitrary criterion or on the basis of perceived similarity on the job analysis. There are several excellent references on the methodology of job analysis. Certainly the DOT and McCormick studies have contributed much to the methodology of job or task analysis. Marsh, Madden, and Christal (1961) described the well-researched procedures used in the Air Force. Larson (1969) and Larson and Blake (1969) described an analysis procedure called zoned analysis. The procedure analyzes jobs in four zones from general characteristics to specific details. Seymour (1966) and Glaser (1966) have described job analysis procedures used by industry for designing training.

The job analysis technique or some adaptation has been used in a variety of ways. Grede, *et al.* (1968) and Dillon and Horner (1967) presented studies of jobs analyzed at a general level and identified groupings such as business occupations, health occupations, service occupations, etc. Most of the studies, however, have been done within one of these broad areas.

Peterson (1962, 1964A, 1964B, 1964C, 1966A, 1966B) did a series of studies designed to suggest techniques for determining courses of study in the technological areas of chemistry and metallurgy, mechanical drafting

and design, electronic data processing, civil and highway, mechanical, and electrical and electronic.

A large number of job analysis-type studies have been done in the agricultural field. Most were done in order to better define the area of agriculturally related occupations. These have generally been statewide studies and have been done in enough states so that it would appear that a person working in this area could find a study done in a state with characteristics similar to his own. Studies in the agriculture occupations area include Gunderson, *et al.* (1966), Mosley (1966), Morrison (1964), Barwick (1965), Drake and Tom (1968), Loreen (1967), McGee (1965), Heaney (1966), Hensel (1968), Baker (1966), Cushman, *et al.* (1965), Hoover, *et al.* (1966), Curtis and Mondart (1967), Cain and Dillon (1966), Wall, *et al.* (1967), and Baker and Woodin (1966).

Job analysis and judgmental clustering has also been done in home economics (O'Donnell, 1967; Ridley, 1967; Shipley, 1967), business and office (Perkins, *et al.*, 1968; Ertel, 1968), public service (Institute for Local Self Government, 1969), justice work (Grant, *et al.*, 1969), health occupations (Franklin, 1965; Gilpatrick and Corliss, 1969), and engineering technology (American Society for Engineering Education, 1964). The cited references are representative of what is probably a much larger number of similar kinds of studies that were not identified or that have never entered the usual dissemination channels.

Most of the job analysis type studies cited above have resulted in the identification of commonalities among jobs. Also, in most of the studies, the results were discussed in terms of their implications for curricula. None of the studies cited above, however, has reported the next step of building and testing curricula on the basis of the findings.

A noteworthy study in which the job analysis approach to the cluster concept was used as the basis for curriculum building was done at the University of Maryland (Maley, 1967; Mietus, 1969). In this study five criteria were used for defining three clusters: construction, electro-mechanical installation and repair, and metal forming and fabrication.

The criteria used for defining the clusters were that the clusters should:

1. be in the area of vocational industrial education,
2. include occupations that are related on the basis of either similar processes, materials, products, or human requirements,
3. be broad enough to include occupations with a wide variety of skills and knowledge,
4. involve occupations that require no more than two years training beyond high school, and
5. provide for the opportunity for geographical and occupational mobility.

Several occupations were then identified and a task analysis was made of each occupation. The task analysis provided the information for building the curriculum. A field study was made of each curriculum and the evalua-

tion indicated that the curricula were effective in attaining immediate objectives of specified levels of knowledge and skills. Additional studies are now being conducted to determine the long-range effectiveness of the courses in producing workers with satisfactory entry skills and who exhibit adaptability for a variety of occupations.

The approach used in the Maryland studies for the clustering of jobs and in curriculum definition seems to have also been used in the Richmond, California, (Asbell, 1967) curriculum projects.

In the studies cited to this point, the clusters have been defined on the basis of perceived similarity using some arbitrary definition of what constitutes similarity. Although this method seems to lack objectivity, evidence is presented by Grunes (1956), Triandis (1959), Gonyea (1961), and Gonyea and Lunneborg (1963) that job perception is quite stable among people.

There are a number of studies in which a mathematical criterion was used to define the clusters. These studies have typically employed a factor analysis or hierarchical grouping methodology. The analytic techniques give the appearance of objectivity in that the clustering is accomplished according to some mathematical criterion. This apparent objectivity is somewhat misleading, however, in that the scores that are used are usually obtained by some judgment of a rater or observer. Furthermore, the criterion for defining a cluster or non-cluster is usually based on a judgment. The most common analytic method is some type of factor analysis of correlation matrices. The correlations may be between jobs or between scales measuring worker behavior on a job. The DOT and the McCormick work used factor analytic procedures, as did several of the studies reviewed later in the paper.

The factor analysis model is useful but has certain limitations. One limitation is that the data are not always appropriate for such a procedure. Another limitation is that, although it can be used to identify clusters, it does not provide much information as to what determined the cluster. It is nice to know that 10 jobs form some sort of cluster, but the pattern of the cluster is still not apparent.

Another analytic technique has had limited use, but seems to have some promise, especially for identifying the components that are causing the cluster to form. This technique is a clustering model. There seem to be two independent lines of development of such a model. Silverman (1966, 1970) has described a numerical taxonomy approach to task analysis. A similar approach is described by Ward (1961) and Orr (1960). Johnson (1967) presented a detailed discussion of the mathematics of this approach. The clustering procedure establishes clusters on the basis of pre-defined criteria so that it is known what determined the cluster.

The work of the Personnel Research Division of the U.S. Air Force is outstanding in its sophisticated treatment of task measurement and analysis. Christal (1970) summarized the work that has been done. They have developed an occupational survey methodology which defines job characteristics at the work-task level. The data from the surveys can be

used to cluster tasks and thus organize course content. They use a hierarchical grouping procedure for clustering. The method also permits the researchers to identify elements of the curriculum that can be eliminated. The extensive work of the Personnel Research Division is a valuable contribution both to the methodology of studying occupations and to the understanding of occupations. Several reports have been issued from this group. The cited reference is a good source for an overview of their work as well as additional references.

Several studies have been done in which factor analytic methodology has been used to cluster occupations ostensibly for curriculum building. There is no report from any of the studies, however, to indicate that the results were used directly for curricula building.

Phipps and Fuller (1964) factor analyzed activity and knowledge scores separately for agriculturally related occupations. They identified 12 activity factors and 12 knowledge factors that could be used in classifying agricultural occupations.

A factor analysis of 63 job competencies in 125 job titles of agriculturally related occupations was reported by Stevenson (1965). The analysis yielded the following competency factors: human relations, salesmanship, business management, agricultural business management, plant and soil science, animal science, agricultural machinery, and construction technology.

A number of factor analyses of competencies and activities of agricultural workers have been done at Purdue University by Coster and Courtney (1965), Clouse and Coster (1965) and Coster and Penrod (1965). In the Coster and Courtney study, the data were ratings of each of 148 agriculturally oriented competencies needed by workers in three agriculturally oriented occupations; farmers, farm real estate brokers, and grain elevator operators. The data were collected from 40 persons in each occupation. The factor analysis yielded six interpretable factors. Three of the factors were judged to represent the three occupations and the other three indicated some commonality among the occupations in terms of agronomy, animal, and mechanical knowledges and competencies.

Love (1966) analyzed data from interviews with job incumbents in the areas of agricultural mechanics, agricultural supplies, food products, forestry and ornamental horticulture. Twelve competency and twelve job title factors were identified. A manager factor was found to be quite general across all of the agricultural occupations.

Data from workers in 47 agricultural and 36 metal fabricating occupations were analyzed by Sjogren, *et al.* (1967). Three clusters were identified in each area. Production agriculture, agricultural industry, and agribusiness in agriculture, and skilled, semiskilled, and business in the metal industry occupations.

Several investigators have focused their efforts on the identification of the knowledge and competencies needed by workers for successful performance in an occupation.

Altman (1966A) administered a large number of performance tests

to high school students. The analysis indicated six general performance areas: mechanical, electrical, spatial, chemical and biological, symbolic, and "people." The results of this study were used extensively in the Quincy, Massachusetts, project (Morrison, 1966).

The work at Washington State University also tended to focus on knowledge (McCloskey, 1968; Rahmlow, 1969). In this work, the tasks that were performed by a large number of workers were identified and analyzed. From the analysis the investigators then either identified the kinds of knowledge to stress in a particular curriculum (for example, Rahmlow and Kiehn, 1967) or the knowledges that generalized across curricula (Rahmlow and Winchell, 1966).

Moss, *et al.* (1970) reported on a procedure to identify the technical concepts possessed by a worker on-the-job and the psychological structure of the concepts. The researchers believe that it is necessary not only to identify the common knowledge across occupations but also to identify whether the organization of the knowledge is also common. They refer to the knowledge and the organization as the map of the technical concept. A methodology for forming the maps has been developed and tested with encouraging results. (Moss and Pucel, 1967; Pratzner, 1969; Smith, 1968). Ammerman (1970) also reported an application of the method in a radar maintenance course setting. One very important contribution of this work is that the procedure identifies commonalities of higher-order concepts and the hierarchical structure of the concepts.

It is evident that many approaches have been used to attempt to identify job clusters. Cunningham (1969) has started on a program which will attempt to effect a synthesis of the many approaches. In a personal communication, he has reported that the instrumentation phase of the work is near completion, and that the instrument has been designed to measure the many different job variables that have been of demonstrated importance in other research.

Within the field of occupational education, the typical approach to resolving the problem of developing curricula for occupational adaptability has been that of job analysis—job clustering. The focus has been on identification of common skills, behaviors, knowledges, etc. across jobs in order to design curricula that are generalizable, or, in effect facilitative of adaptability. There are limitations to this approach which are discussed in the critique section of this paper.

Occupational adaptability is not just a function of being able to perform a variety of tasks. There are affective dimensions to adaptability that are important. The next section contains a review of some studies of relevance in this area.

Work Adjustment

Adaptability to a work situation has several facets. Firstly, there is the aspect of being able to perform satisfactorily in the occupations. This aspect is the one that has been the primary focus of the job-analysis, job-clustering studies reviewed above. Dawis, England, and Lofquist

(1964) referred to this aspect as the "satisfactoriness" of the worker in his work environment. They also had a dimension of "satisfaction" of the worker in his work environment. A second aspect of work adaptability then is in terms of the satisfaction that the worker derives from the work. A satisfied worker is one that has adapted to the work situation. A third aspect of adaptability is with respect to the general social milieu within which the individual is operating. If the worker adapts well to the neighborhood and the community, then he has made an adjustment that is critical to work adaptability. This section of the paper reviews some studies of relevance to the latter two affective aspects of adaptability.

Ronan (1970) reviewed the literature on variables relating to job satisfaction. He found that in many studies the following dimensions of job satisfaction emerged: "(a) the content of the work, actual tasks performed, and control of work, (b) supervision of the direct sort, (c) the organization and its management, (d) opportunities for advancement, (e) pay and other financial benefits, (f) co-workers, and (g) working conditions. He concluded, however, that the relationships among the variables are complex and also tend to be specific to a situation rather than generalizable.

The Ronan paper is an excellent source for identifying the work that has been done in the area of job satisfaction. A framework for the study of job satisfaction is also presented, taken from Payne, *et al.* (1967).

Special mention should be made of the work of Herzberg and his associates in the area of worker satisfaction. The work, reported in Herzberg, Mausner, and Snyderman (1959), has stimulated a large amount of research. Grigaliunas and Herzberg (1971) includes references to some of the most recent work in this area. Borgen, *et al.* (1968) reported on a promising line of research on occupational reinforcer patterns.

The extent to which factors in the social environment are related to worker adaptability has not been studied as thoroughly as have factors in the work environment. A number of studies on worker mobility that have been conducted recently do provide some information, however. A number of studies have been made of the voluntary and non-voluntary mobile person.

Johnson and Johnson (1968) and Johnson and Kiefert (1968) studied migration patterns in North Dakota. Generally the migrants were more educated than the non-migrants, and the outmigration was related to occupational aspiration. The migrants experienced few adjustment problems. Similar results were obtained by Geschwind and Putton (1961) and Olson (1960). Taves and Coller (1964) found that occupational aspiration and career advancement were related to migration decisions among recent high school graduates in Minnesota, but a study of recent graduates in Appalachia did not obtain this relationship (Schwarzeller, 1964). The voluntary migrant can be and is selective in both the job and the social milieu. Olson (1960) found distinctions between the voluntary and non-voluntary migrants. The voluntary migrants were more selective in the jobs they took and were better adjusted than the non-voluntary migrants.

During the 1960's several retraining and relocation programs were conducted as part of the War on Poverty. Evaluations of these programs have provided some evidence on factors associated with successful adjustment of non-voluntary migrants, which is what a relocated worker essentially is. Factors that were related included availability of adequate housing, financial assistance for relocation, assistance and counseling for orientation to the new job and community, age, and education level. (Ruesink, *et al.,* 1968; Ruesink, *et al.,* 1969; Nichols and Abrams, 1968; Tuskegee Institute, 1968; Virginia Employment Commission, 1966; Texas Employment Commission, 1969; Georgia Department of Labor, 1969). Schnitzer (1966) in a cross cultural study found these factors to be of common influence in relocation programs in several countries. Stevenson (1968) studied Eskimo relocation and Ablon (1964) studied American Indian relocation. The same factors were important in relocation of these two groups, but a kinship factor was also of special importance for Eskimos and Indians.

The reports of the relocation efforts indicate considerable success if adequate assistance is provided. Somers (1966) has raised the question, however, of whether the relocation allowances are justified as a social investment. Evidence on the question is not yet available.

The relocation studies do demonstrate that the adaptability of a person to a new work situation is not solely dependent on having work-related skills. The worker must also be able to adapt to the broad social environment.

The studies on job-clustering, job satisfaction, and mobility do bring out the following points.

1. Jobs can be grouped into meaningful clusters, and a person with the ability to perform acceptably in a specific job has skills that are generalizable to other jobs. Thus, in terms of skill, the worker has an adaptability base.
2. If satisfaction with a job is necessary for true adaptability, then one's adaptability is related to many factors in the work environment other than the ability requirements of the work.
3. The satisfactory adaptability of the worker to a new work situation is related to successful adjustment to the broad social environment as well as to the work environment.

A considerable amount of effort has been devoted to studies of jobs and job satisfaction. Although progress has been made in understanding this field, there are certain limitations in the research as well as some lines of research that have not been developed. In the following section of the paper we have identified some of the limitations and research possibilities.

Critique

Much of the job-clustering research has been predicated on the belief that clusters can be identified that will serve as a basis for building a

more powerful curriculum than a curriculum based on teaching for a specific job—powerful in the sense that it would be optimally efficient and effective for preparing the student for the world of work. Morrison (1969) pointed out, however, that it is unlikely that a curriculum based on a cluster would be identifiably different from a curriculum for any one job in the cluster because, by definition, the curriculum must contain the elements required by that job. Thus, there is no assurance that a cluster-based curriculum would be more powerful. On the other hand, it does seem that at least the efficiency criterion might be met through clustering. If common elements across jobs can be identified, then these might be taught more efficiently since they could be taught to large groups of students which would tend to reduce instructional costs per student.

Perhaps it would be useful if some empirical studies were designed to test the power of cluster-based versus single job-based curricula, but such studies would probably result in acceptance of the null hypothesis. Rather, the purpose of job-clustering studies should be defined in terms of what they can do. Morrison has indicated some of the potential uses.

One use is in terms of guidance. By identifying for students the various jobs that require certain skills, abilities, and interests, they will have a broad information base for making educational and vocational decisions. Furthermore, it would seem that some meaningful predictions might be made regarding the student's likelihood of success in a number of occupations. Shaycroft (1969) has developed a methodology for computing a job propinquity index that might be used in this way.

Other uses of clustering information pointed out by Morrison were to identify training situations that might optimize transfer, to identify reasonable additions to the curriculum (Christal indicated that possible deletions might be identified), and to select students and staff. Jerome Moss in a personal communication pointed out that clustering studies also might be useful in restructuring and redefining jobs.

Hamreus (1969) also commented on the purpose of clustering studies. He suggested that clustering is a tool for obtaining insight about jobs, but that it is one or more steps removed from actually building the curriculum.

The important point made by both Morrison and Hamreus is that it is unrealistic to expect that results of job-clustering studies will be immediately applicable to curriculum building. Perhaps this is why there are quite a few clustering studies but few that have gotten to the stage of curriculum development.

One of the difficulties encountered in using the results of clustering studies is the criterion problem. Sjogren (1969) and Hamreus commented on this problem. The question essentially is one of no objective criterion for deciding that a grouping of jobs is a cluster or not. No matter what kind of measurement and analysis techniques are used, the determination of the clusters is to a great extent decided *a priori* when the decision is made to study certain jobs and not study others. This is not a critical problem if the investigator realizes the situation and recognizes the arbi-

trariness of the clusters obtained in a single study. Empirical studies would be desirable in which the mix of jobs studied would be varied to observe the variation in clusters as related to the varied mix. It is likely that any single job would sort into different clusters depending on the mix of jobs being studied. Such variation would be interesting and useful information about the job.

Another limitation of clustering studies is that they have been done primarily on a cross section of jobs at a common skill level. Few studies have attempted to identify commonalities in jobs at hierarchical levels. Clustering should be a viable methodology for defining career lines, but it has not been used extensively in this way.

Hamreus (1969) pointed out that job analysis-job clustering methodology should be applied to defining future job requirements. General worker adaptability would seem to be quite dependent on ability to adapt to a job that is not yet defined, at least for many people. Perhaps clustering methodology can be applied to the problem of predicting future jobs. Pilot studies in this regard would be desired.

Ronan (1970), in his review of variables related to job satisfaction, indicated many of the limitations of this work. He pointed out the familiar measurement problem although he did indicate a belief that measurement of job satisfaction was quite reliable. The measurement of the variables related to job satisfaction was a problem. Perhaps a more critical problem is that the results of job satisfaction studies tend to be situation specific. This outcome may be due to the measurement problem, but more likely it is due to studying a limited number of variables in any study. Work environments are complex, and multi-variate approaches are needed. When only one variable is examined, its relationship to job satisfaction may be obscured by its interaction with another variable or variables that may be operating in one situation and not in another. Multi-variate approaches are necessary to insure sensitivity. The same consideration is appropriate with respect to studies of mobility.

Another point with respect to job adjustment studies like those of satisfaction and mobility is that they are predominantly cross-sectional. Kuvlesky (1966) has stressed the need for longitudinal studies of job adjustment or adaptability. A study in this vein has been started by Parnes, *et al.* (1968). This line of research should be helpful in identifying those individual difference characteristics that are predictive of successful vertical and horizontal mobility.

Noticeable progress has been made in our understanding of the world of work over the past 20 years. Methods for identifying commonalities across jobs have been refined. A body of knowledge is developing on factors related to job satisfaction and successful job mobility. There is increased understanding of the phenomenon of generalization of learning. The knowledge in these areas is still far from complete, however. Furthermore, the application of this knowledge to predicting or providing for worker adaptability and work satisfaction is still not clear.

This review, as is true of any review, leads to two general conclusions.

The practitioner has available a considerable amount of accumulated knowledge that can be of help in making curricular and personnel decisions. Often, however, the practitioner will not find the answers to questions directly, but will have to make the "inductive leap" from the research to the specific situation. The second conclusion is that although the research needs are still large, the person with an interest in studying in this area does not have to start at point zero.

It is hoped this review will serve the purpose of helping both the practitioner and the researcher identify sources relevant to their needs.

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